NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

BACHELOR OF SCIENCE HONOURS DEGREE

MAY 2011

METABOLIC PROCESSES II SBB 2212

3 HOURS (100 MARKS)

INSTRUCTIONS

Answer Four (4) Questions. Each question carries 25 marks. Where a question contains subdivisions, the mark value for each subdivision is given in brackets. Illustrate your answer where appropriate with large, clearly labelled diagrams.

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1. (a) Discuss the transport of triacylglycerols and cholesterol by lipoproteins. (15 marks)

   (b) Describe the regulation of cholesterol biosynthesis. (10 marks)

2. (a) Describe the common pathway in the synthesis of aromatic amino acids in bacteria. (13 marks)

   (b) Classify amino acids into the six biosynthetic pathways and identify their precursors. (12 marks)

3. (a) Explain the role of carbomyl phosphate in pyrimidine biosynthesis and compare the two carbomyl phosphate synthetase reactions that occur in eukaryotic cells. (15 marks)

   (b) Outline the regulation of the biosynthesis of the purine nucleotides and name the committed step in the pathway. (10 marks)

4. (a) Describe the biosynthesis of calcitriol and list the effects of its deficiency. (20 marks)

   (b) Identify five important functions of bile acids. (5 marks)

5. (a) Explain why RNA synthesis is essential for DNA synthesis in prokaryotes. (4 marks)

   (b) Give the reasons why most nucleotides that have been misincorporated during DNA synthesis in bacteria do not lead to mutant progeny. (5 marks)

(c) Briefly describe the role of the following different proteins and enzymes in *E coli* DNA replication:

i) DnaB helicase; (2 marks)
ii) single-strand binding; (2 marks)
iii) DNA gyrase; (2 marks)
iv) primase; (2 marks)
v) DNA polymerase III holoenzyme; (2 marks)
vi) rep protein; (2 marks)
vii) DNA polymerase I; and (2 marks)
viii) DNA ligase. (2 marks)

6. (a) Describe the following stages in protein synthesis:

i) initiation phase and include the use of Shine-Dalgarno sequences; (5 marks)
ii) elongation phase; and (5 marks)
iii) termination phase. (5 marks)

(b) The following are common antibiotics and toxins which inhibit protein synthesis. Describe briefly, how they achieve this inhibition.

i) Tetracycline (2 marks)
ii) Puromycin (2 marks)
iii) Chloramphenicol (2 marks)
iv) Clindamycin (2 marks)
v) Diphtheria toxin (2 marks)

END OF QUESTION PAPER